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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/538,961 | 06/14/2005 | Piotr Mirowski | 57.0547 US PCT | 7508 |

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SCHLUMBERGER-DOLL RESEARCH
ATTN: INTELLECTUAL PROPERTY LAW DEPARTMENT
P.O. BOX 425045
CAMBRIDGE, MA 02142

| EXAMINER | |
|---|---|
| KENNEDY, ADRIAN L | |
| **ART UNIT** | **PAPER NUMBER** |
| 2121 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 04/05/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 10/538,961 | MIROWSKI, PIOTR |
| | Examiner | Art Unit |
| | Adrian L. Kennedy | 2121 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *18 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

### *Examiner's Detailed Office Action*

1. This Office Action is responsive to **Amendment After Non-Final Rejection,** filed **January 18, 2007.**

2. **Claims 1-14** were originally presented.

3. **Claims 1, 3, 8, and 10** were amended.

4. **Claims 1-14** will be examined.

### *Claim Rejections - 35 USC § 101*

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 1-7 are rejected under 35 U.S.C 101 as being directed to nonstatutory subject matter. In particular independent claims 1 and 3 are considered to be non statutory because they do not produce a "useful, concrete and tangible result". This position is supported by the fact that applicant's claimed "systems" recite multiple components (i.e. a neural network, a means for integrating, a storage, etc.), but it is not clear what "useful, concrete and tangible result" is produced by these components.

### *Claim Rejections - 35 USC § 102*

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for

patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-4, 6, 8, 9-11 and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by *West et al.* (USPN 6,438,493).

Regarding claim 1:

West et al. teaches

A system for inferring geological classes (C 1, L 10-12; "*characterizing and mapping seismic facies*") from oilfield well input data (C 1, L 10-12; "*seismic data*") comprising a neural network (C 3, L 13-14; "*probabilistic neural network*") for inferring class probabilities (C 7, L 51-54; "*extract classification probabilities*"), characterized in that said system further comprises means for integrating class sequencing knowledge (C 3, L 61-63; "*seismic data is seismic attribute or amplitude data, including, but not limited to, near, far and full-stack data*"; C 3, L 64-65; "*at east one cross-section is selected*") and optimising said class probabilities according to said sequencing knowledge (C 8, L 24-37; The examiner takes the position that the process of improving result by varying the input data window is equivalent to applicant's claimed optimization process. Additionally, West et al. previously taught that the input data consisted of seismic attribute data including class sequence knowledge (full-stack data)), and storage for said inferred geological classes (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*"; The examiner takes the position that by teaching the storing of the

facies, it is inherent that there is some form of storage in the invention of West et al.).

Regarding claim 2:

West et al. teaches

The system wherein the means for integrating class sequencing knowledge and optimising said class probabilities according to said sequencing knowledge comprises a hidden Markov model.

The examiner takes the position that the use of a hidden Markov model is inherent in the invention of the West et al. This fact is evident in the fact that the in probabilistic pattern classification process (C 7, L 23-25; "*pattern classification*"), West et al. makes use of a Markov process (C 4, L 62-65; "*Markov Chain Analysis*") where the hidden states in the model are the lithofacies (C 7, L 25-28; "*unknown points*"), the observed state in the model is the input seismic data (C 7, L 25-28; "*known points*"), and the goal is to determine the lithofacies that most likely to generated the seismic data (C 7, L 25-28; "*classification and prediction of unknown points*").

Regarding claim 3:

West et al. teaches

An automated system for inferring geological classes (C 1, L 10-12; "*characterizing and mapping seismic facies*") from oilfield well input data (C 1, L 10-12; "*seismic data*"), comprising a data input vector (C 7, L 7-10; "*input vector*"), a neural network trained to infer from said input vector a class sequence or class probability vector, and a modifier

for correcting said class sequence or class probability vector using prior knowledge of class sequence or class probability (C 7, L 10-13; "*through training, the weights of the network are modified such that on a specific set of training examples, modification of the input attribute vectors produce a desirable outcome*"; The examiner takes the position that the use of a class sequence is anticipated by the use of seismic data (C 3, L 61-63; "*seismic data is seismic attribute*"), and the use of a class probability vector is anticipated by the use of classification probabilities (C 7, L 51-54; "*classification probabilities*")), and storage for said inferred geological classes (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*"; The examiner takes the position that by teaching the storing of the facies, it is inherent that there is some form of storage in the invention of West et al.).

Regarding claim 4:

West et al. teaches

An automated system wherein the modifier (The examiner takes the position the modifier is the neural network) uses the prior knowledge of class probability distribution and class transition probability (C 6, L 58-61; "*initial textural attributes*"; The examiner takes the position that by teaching that textural attributes inherently contain statistical information (C 5, L 41-43; "*statistical measures, called textural attributes*") related to seismic data, West et al. anticipates the use of class probability distribution. Additionally, by teaching that seismic data include stratigraphic information, West et al. anticipated the use of class transition probability information.).

Regarding claim 6:

West et al. teaches

An automated system wherein the modifier includes a Bayesian based probability calculator (C 7, L 22-23; "*probabilistic neural networks are parallel implementations of a standard Bayesian classifier*").

Regarding claim 8:

West et al. teaches

A method for inferring geological classes from oilfield well input data, comprising the following steps:

inferring class probabilities (C 7, L 51-54; "*extract classification probabilities*") with a neural network (C 3, L 13-14; "*probabilistic neural network*");

and integrating class sequencing knowledge (C 3, L 61-63; "*seismic data is seismic attribute or amplitude data, including, but not limited to, near, far and full-stack data*"; C 3, L 64-65; "*at east one cross-section is selected*"; and optimising said class probabilities according to said sequencing knowledge (C 8, L 24-37; The examiner takes the position that the process of improving result by varying the input data window is equivalent to applicant's claimed optimization process. Additionally, West et al. previously taught that the input data consisted of seismic attribute data including class sequence knowledge (full-stack data)); and

storing said inferred geological classes (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*").

Regarding claim 9:

West et al. teaches

The method wherein the integrating class sequencing knowledge and optimising said class probabilities according to said sequencing knowledge is achieved according to a hidden Markov model.

The examiner takes the position that the use of a hidden Markov model is inherent in the invention of the West et al. This fact is evident in the fact that the in probabilistic pattern classification process (C 7, L 23-25; "*pattern classification*"), West et al. makes use of a Markov process (C 4, L 62-65; "*Markov Chain Analysis*") where the hidden states in the model are the lithofacies (C 7, L 25-28; "*unknown points*"), the observed state in the model is the input seismic data (C 7, L 25-28; "*known points*"), and the goal is to determine the lithofacies that most likely to generated the seismic data (C 7, L 25-28; "*classification and prediction of unknown points*").

Regarding claim 10:

West et al. teaches

A method for inferring geological classes from oilfield well input data, comprising the steps of

generating a data input (C 4, L 16-19; "*textural attributes*") based on said well input data (C 3, L 61-63; "*seismic data*");

using a neural network (C 3, L 13-14; "*probabilistic neural network*") to generate a class sequence (C 7, L 23-25; "*pattern classification*") or class probability vector inferred from said input; and

correcting said class sequence or class probability vector using prior knowledge of class sequence or class probability (C 7, L 10-13; "*through training, the weights of the network are modified such that on a specific set of training examples, modification of the input attribute vectors produce a desirable outcome*"; The examiner takes the position that the use of a class sequence is anticipated by the use of seismic data (C 3, L 61-63; "*seismic data is seismic attribute*") the use of a class probability vector is anticipated by the use of classification probabilities (C 7, L 51-54; "*classification probabilities*")); and

storing said inferred geological classes (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*").

Regarding claim 11:

West et al. teaches

The method wherein prior knowledge of class probability distribution and class transition probability is used to correct the class sequence or class probability vector (C 7, L 10-13; "*through training, the weights of the network are modified such that on a specific set of training examples, modification of the input attribute vectors produce a desirable*

*outcome*"; The examiner takes the position that the use of a class sequence is anticipated by the use of seismic data (C 3, L 61-63; "*seismic data is seismic attribute*"), and the use of a class probability vector is anticipated by the use of classification probabilities (C 7, L 51-54; "*classification probabilities*")).

Regarding claim 13:

West et al. teaches

The method wherein the correction includes a Bayesian based probability calculation (C 7, L 22-23; "*probabilistic neural networks are parallel implementations of a standard Bayesian classifier*").

### *Claim Rejections - 35 USC § 103*

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 5, 7, 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over *West et al.* (USPN 6,438,493) in view of *Doyle et al.* (USPN 5,504,479).

Regarding claim 5:

West et al. teaches the method of claim 4, but fails to teach the use of a Viterbi sequence. However, Doyle et al. does teach.

An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of determining the most likely sequence of hidden states that result in a sequence of observed states, and also for the purpose of *communicating signal from logging tools disposed in wellbores* (C 1, L 8-11).

Regarding claim 7:

West et al. teaches the method of claim 3, and the use of a Bayesian based probability calculation, but fails to teach the use of a Viterbi sequence.

However, Doyle et al. does teach.

An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of determining the most likely sequence of hidden states that result in a sequence of observed states, and also for the purpose of *communicating signal from logging tools disposed in wellbores* (C 1, L 8-11).

Regarding claim 12:

West et al. teaches the method of claim 10, but fails to teach the use of a Viterbi sequence.

However, Doyle et al. does teach.

An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of determining the most likely sequence of hidden states that result in a sequence of observed states, and also for the purpose of *communicating signal from logging tools disposed in wellbores* (C 1, L 8-11).

Regarding claim 14:

West et al. teaches the method of claim 10, and the use of a Bayesian based probability calculation, but fails to teach the use of a Viterbi sequence.

However, Doyle et al. does teach.

An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of

determining the most likely sequence of hidden states that result in a sequence of observed states, and also for the purpose of *communicating signal from logging tools disposed in wellbores* (C 1, L 8-11).

***Response to Arguments***

Applicant's arguments filed on January 18, 2007 have been fully considered but are found to be non-persuasive. The unpersuasive arguments made by the Applicant are stated below:

In reference to Applicant's argument:

> The "seismic facies" of the West document are listed in col. 5, lines 17-24 and in Figs. 3B-3F. Seismic facies are derived from the seismic texture which "is a quantitative measure of the reflection amplitude, continuity, and internal configuration of reflectors" (col. 4, lines 10-16).

Examiner's response:

The examiner takes the position that in regards to this argument, the applicant is attempting to argue that because the seismic facies of West et al. are classified different from applicant's geological classes. However, the examiner asserts that seismic facies are identical to applicant's "geological classes". This position is supported by West et al. teaching in Column 1, Lines 19-22 that "*a seismic facies is a stratigraphic unit or region that has a characteristic reflection pattern distinguishable from those of other areas*". The examiner asserts that because a seismic facies defines stratigraphic unit, that is equivalent to the geological classes of the applicant's invention. This assertion is bases on the applicant's arguments which state that "*the term "geological classes" is hence to be interpreted as a classification according to "geological features" such as the type of rock (limestone, clone, etc)*". The examiner takes the position that a

seismic facies (geological class) is the class of a stratigraphic unit (type rock) according to the reflectance (geological features) of that stratigraphic unit or region.

Based on the above arguments, the examiner maintains the argument that seismic facies are equivalent to geological classes.

In reference to Applicant's argument:

> Further regarding claim 1, West et al. does not teach or suggest using "input data from oilfield wells".
>
> Seismic data are commonly acquired from the surface. Though there are seismic data acquired from wellbore, West et al, refer in the background section to "basin-wide scale" or "single reservoir implying normal surface data.

Examiner's response:

The examiner takes the position that because the applicant's claimed invention on claims that the "input data [is] from oilfield wells", but does not explicitly claim whether the well data is derived from the surface or below the surface. Regardless, based on the applicant's argument that "seismic data [can be] acquired from wellbore" and a broadest reasonable interpretation of acquiring seismic data, the examiner takes the position that by not explicitly reciting whether the seismic data is obtained from the surface or below the surface, that West et al.'s teaching anticipates all methods of gathering seismic data.

In reference to Applicant's argument:

> Further regarding claim 1, West et al. does not teach or suggest using "class sequencing knowledge".
>
> The examiner appears to equate 'full stack data" as mentioned in West et al. with "class sequencing knowledge". In seismic acquisition, the term "stacking" is used as expression for adding of seismic recording to reduce the signal-to-noise ratio. It is clear that this signal processing step in seismic has no relationship of "geological class sequencing knowledge", which should be interpreted as knowledge of the sequence of geological classes in a section of earth.

Examiner's response:

The examiner takes the position that based on the applicant's argument that "stacking" is adding seismic information to reduce the signal-to-noise ratio, the examiner takes the position that the seismic information is added to better determine the class of seismic facies. Based on this position the examiner asserts that the stacking of seismic information is equivalent to the "integrating of class sequencing knowledge".

In reference to Applicant's argument:

> Further Doyle et al. relates to the field of communication data from a well bore. Prima Facie, the field of data communication, even if related to communication from a well bore, is not related to the field of inferring a geological classification. The examiner has not shown how a skilled person would be motivated to combine the teaching of West et al., which relates to data interpretation, with the teaching of Doyle et al., which relates to data communication from the wellbore to the surface, to arrive at a method for using Viterbi algorithms to infer a geological classification.

Examiner's response:

The examiner takes the position that in the applicant's invention that "input data" is well bore data. This position is supported by the applicant's disclosure which state that *"according to the present to the present invention, the terms "measured input data" or "INPUT DATA" refers to, in particular, downhole logs*" in Paragraph 0002. Additionally, that examiner respectfully agrees that the invention of Doyle et al. relates to the field of communication data from a well bore. Furthermore, the examiner asserts that the invention that the invention of West et al. relates generally to classifying seismic data. This position is supported by West et al. teaching in Column 1, Lines 9-11 that his invention is a *"method of characterizing and mapping seismic*

*facies in seismic data*". Based on the previously set forth positions, the examiner asserts that it would have been obvious to one skilled in the art to combine the invention of West et al. with the invention of Doyle et al. for the purpose of facilitating the classification (West et al.; C 1, L 9-11; "*characterizing*") of data from a well bore *communicating signal from logging tools disposed in wellbores* (Doyle et al.; C 1, L 8-11).

In reference to Applicant's argument:

> Further, Doyle et al. states clearly that the use of Viterbi algorithm in the decoder is motivated strictly as a requirement (col. 13, lines 58-60 for "Trellis encoding" (col. 13, lines 58-60). Trellis encoding is a known method in data communication. Again, this specific use of the Viterbi algorithm has not recognizable relation ship with a geological application as the present invention.

Examiner's response:

The examiner takes the position that the Viterbi algorithm applied to the trellis encoding in the invention of Doyle et al., is not required, but Doyle states that it is "typically required". Doyle et al. goes on to teach that it is required in order to ensure that "*successive symbols [i.e. geological classes, stratigraphic units, etc.]occur within the predetermined pattern*" (C 13, L 58-62). Based on Doyle et al. teaching the use of the Viterbi algorithm in processing of wellbore data, the examiner asserts that it would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adrian L. Kennedy whose telephone number is (571) 270-1505. The examiner can normally be reached on Mon -Fri 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on (571) 272-3687. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ALK

Anthony Knight

Supervisory Patent Examiner
Technology Center 2100